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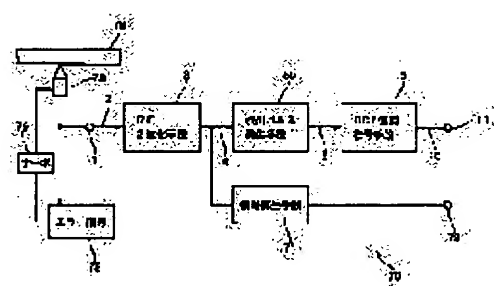
(54) **DATA READER**

(57)Abstract:
PROBLEM TO BE SOLVED: To detect precisely the BCA data even when the number of disk revolution are shifted from a prescribed value, and a track servo is turned off.
SOLUTION: An analog signal 2 is binarized by an RF binarization means 3 of a system digital controlling a slice level, and a detection pulse 8 is generated by a detection pulse generation means 50 when the digital pulse width of the regenerative pulse 4 of the output of the binarization means 3 is a prescribed length or above is detected, and the BCA data are reproduced with the BCA detection pulse by a demodulation decoding means 9.



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CLAIMS

[Claim(s)]
[Claim 1] Data are set from the burst cutting field of an optical disk to the data reader in which read is possible. In order to reproduce the signal recorded on the optical disk by the pit, are a means to make binary the analog signal read in the optical disk, and to output a digital pulse, and the pulse width of the playback pulse after binary-izing is measured. The slice level made binary so that the pulse width may become a desired value Controllable RF binary-ized means, The data reader which has a detection pulse generating means to count the pulse width of said playback pulse, and to output a detection pulse when the value is beyond a predetermined value, and a recovery decode means to decode data based on a format of a burst cutting field from said detection pulse.
[Claim 2] It is the data reader characterized by having a means by which said RF binary-ized means can fix said slice level in claim 1.
[Claim 3] It is the data reader characterized by being the same as the bias voltage of the analog signal with which the fixed value of said slice level is inputted into this RF binary-ized means in claim 2.
[Claim 4] It is the data reader characterized by having the means which makes regularity pulse width of the detection pulse by which said detection pulse generating means is supplied to said recovery decode means in claim 1.
[Claim 5] Said detection pulse generating means is a data reader characterized by carrying out the mask of the count result of the pulse width of said playback pulse while said detection pulse is outputted in claim 4.
[Claim 6] It is the data reader which is equipped with a means by which said detection pulse generating means distinguishes the polarity of said playback pulse in claim 1, and is characterized by outputting a detection pulse when the pulse width of one polar pulse is beyond a predetermined value.
[Claim 7] The data reader characterized by having had the CLV control means which measures the pulse width of said playback pulse and controls the rotational speed of an optical disk in claim 1, and equipping this CLV control means with the function of said detection pulse generating means.
[Claim 8] The data reader characterized by a truck servo being possible in an optical head so that it may have a tracking servo means and the optical spot for detection may be formed in the mirror field between a pit train and a pit train in claim 1.

[Translation done.]

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2.**** shows the word which can not be translated.
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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] The optical disk regenerative apparatus of this invention are playback of DVD (Digital VersatileDisk), and a thing concerning the signal regeneration of a burst cutting field (BCA (BurstCutting Area)) especially.
[0002]
[Description of the Prior Art] A burst cutting field (it sets henceforth and is BCA) is one of the data storage areas specified by DVD specification (DVD Specifications for Read-Only Disc / Part1.Physical Specifications Version1.0 Annex K:Burst Cutting Area-(BCA) Code). In a BCA field, the stripe from which reflective film, such as aluminum currently formed in the inner circumference side of the DVD disk which stuck two substrates, was removed long and slender to radial can be formed by an YAG laser etc., and a bar code-like signal can be formed by arranging in accordance with the periphery of the most inner circumference. Therefore, it is possible to record the information on a different class from the signal recorded by the pit on the truck of an optical disk on a BCA field with a bar code-like signal, and information, such as a serial number of a disk, can be recorded.
[0003] Signs that stripe (bar code)-like record is recorded on drawing 15 by BCA91 of the DVD disk 90 are shown typically. In the part of record to the shape of a stripe, since the reflective film is cut, light penetrates. For this reason, if it reproduces applying the BCA field 91 with an optical head (optical pickup), the amount of reflected lights will fall off a focus to near the zero level in the part of stripe-like record, and compared with the usual pit, a signal with a long period with the large amplitude is reproduced. The principle wave of an analog regenerative signal is used at drawing 16 , and the situation is shown.
[0004] If the BCA field 91 is used, since individual information can be added for every one disk of ROM of DVD, the application to partial sale of contents, a cooperation system with the Internet, etc. is considered. The modulation technique of BCA carries out RZ record using phase encoding (PE modulation). An error correction sign is Reed Solomon code RS (52 48) of the interleave length 4.
[0005] In the conventional optical disk regenerative apparatus National technical report () [National] As indicated by Technical Report (individual information record technique BCA (Burst Cutting Area) to the ROM disk of Vol.43 No.3 Jun.1997:DVD) The analog regenerative signal from an optical head by letting a low pass filter pass It discriminates from the signal (it sets henceforth and is a BCA signal) by the bar code (stripe) recorded on the BCA field, and the signal (it sets below and is a RF signal) which reproduced the pit of DVD. He is trying to obtain the data recorded on BCA by changing into a digital signal (it setting henceforth and being a BCA detection pulse), and carrying out the recovery decode of the pulse signal by the software of a microcomputer.
[0006] The block diagram of the part which decodes the data recorded on drawing 17 by BCA in the conventional optical disk regenerative apparatus is shown. RF signal 101 inputted from the terminal 100 has a low pass filter 102 let it pass, and makes the analog signal 103 after a filter binary with a comparator 104. From the BCA detection pulse 105 acquired by this, the BCA recovery decoder circuit

106 carries out the recovery decode of the BCA data based on a format of BCA, and outputs them to a terminal 107.
[0007]
[Problem(s) to be Solved by the Invention] However, in the conventional optical disk regenerative apparatus, RF signal component is completely unremovable from the signal of BCA with a simple low pass filter. When matching with the band of the low pass filter for furthermore separating the signal and RF signal of BCA and the frequency of the RF signal decided by the engine speed of an optical disk could not be taken, it became impossible for separation of a signal to have carried out well and it changed into a digital binary-ized signal with a comparator etc., it had the technical problem of RF signal component becoming impossible as for playback of a leakage lump and exact BCA data.
[0008] Moreover, a BCA field has width of face fully wider than a track pitch, it applies to two or more trucks, and data exist. For this reason, where a truck servo is turned OFF, the signal of BCA is reproducible, but since it will pass through the field called a mirror with a high reflection factor when an optical spot passes through between a pit train (truck) and pit trains if it is actually going to reproduce, a RF signal is disturbed. Therefore, since a mirror component leaks in case a BCA signal is changed into a digital binary-ized signal, in the recovery decoder circuit 106, the problem that time amount cannot be spent or BCA data cannot be reproduced correctly is also in error processing for reproducing BCA data.
[0009] The signal observation wave of each part in the conventional regenerative apparatus mentioned above to drawing 18 is shown. the wave of a RF signal -- the wave of the BCA signal which let the low pass filter pass for 101 -- in 103, it turns out that removal of RF component is not performed enough. For this reason, there is a part which is carrying out glitzy ****** in the BCA detection pulse 105. moreover, the wave of a RF signal when passing through a mirror field -- even if fluctuation of the amplitude of 101 is after a low pass filter -- the wave of a BCA signal -- it turns out that it has ridden on 103 and there is a part where a BCA detection pulse will fall out in if the party rate of it is carried out with a threshold Vth, or a location shifts. In such the condition, playback of exact BCA data becomes impossible.
[0010] Then, this invention aims at offering the high data reader of the ability to regenerate of BCA data. It aims at offering the data reader of the optical disk which can reproduce BCA data correctly also in the condition [having turned off the time of the disk engine speed being especially shifted from the specified speed, and the truck servo].
[0011]
[Means for Solving the Problem] For this reason, the digitized playback pulse which is the output of an RF binary-ized means to make a RF signal binary is adopted, and since the period is very longer than a RF signal, he is trying for a BCA signal to separate a RF signal and a BCA signal by counting the pulse width of a playback pulse in this invention instead of a low pass filter separating a RF signal and a BCA signal. Data from the burst cutting field of the optical disk of this invention namely, the data reader in which read is possible In order to reproduce the signal recorded on the optical disk by the pit, are a means to make binary the analog signal read in the optical disk, and to output a digital pulse, and the pulse width of the playback pulse after binary-izing is measured. The slice level made binary so that the pulse width may become a desired value Controllable RF binary-ized means, The pulse width of a playback pulse is counted, and when the value is beyond a predetermined value, it has a detection pulse generating means to output a detection pulse, and a recovery decode means to decode data based on a format of a burst cutting field from a detection pulse.
[0012] By using the playback pulse of RF binary-ized means, it is possible to acquire the wave by which the RF signal and the BCA signal were made binary. And RF component can be removed from a BCA signal nearly completely by choosing a BCA signal with the pulse width. Therefore, from a detection pulse generating means, it can read, few detection pulses of an error can be outputted, and BCA data can be decoded with a sufficient precision with a recovery decode means.
[0013] As for the inside of the read of BCA data, as previously shown in drawing 16 , the pulse width of the playback pulse after binary-izing differs from the time only of a RF signal with a stripe-like BCA signal. Therefore, it is adjusted in the direction in which slice level narrows pulse width of a BCA

signal, consequently a RF signal becomes easy to ride. Therefore, when establishing the means which can fix slice level to RF binary-ized means and reading a BCA signal, it is desirable to fix slice level. making the fixed value of slice level the same as the bias voltage of the analog signal into which it is inputted by RF binary-ized means -- the amplitude of an analog signal -- since it is mostly sliceable at the core, a BCA signal is separable with a sufficient precision.
[0014] On the other hand, after counting the pulse width of a playback pulse and judging a BCA signal in a detection pulse generating means, it is desirable to establish the means which makes regularity pulse width of the detection pulse supplied to a recovery decode means. The decode mistake by the recovery decode means can be prevented by arranging the pulse width of a detection pulse. Furthermore, while arranging the pulse width of a detection pulse with the pulse width of the suitable die length according to a BCA format and outputting the detection pulse, the error detection by a defect etc. can be disregarded by carrying out the mask of the count result of the pulse width of a playback pulse.
[0015] The clock obtained from PLL by the RF signal is sufficient as the count clock which supplies the timing counted in a detection pulse generating means, and a system clock may be used for it.
[0016] Furthermore, as for the signal when passing through a mirror field, ignoring is desirable, when a truck servo is OFF and it takes reading a BCA signal into consideration. Therefore, a means to distinguish the polarity of a playback pulse for a detection pulse generating means is established, the polar pulse generated when it passes through a mirror field is disregarded, and when one polar pulse width is beyond a predetermined value, it is desirable to output a detection pulse.
[0017] It is also effective to turn on in reversed polarity on the other hand, while confirming a tracking servo, and to carry out the truck servo of the optical head so that the optical spot for detection may be formed in the mirror field between a pit train and a pit train. If a truck servo is turned on to a mirror field, RF signal component which rides on the analog signal acquired from an optical head decreases, since a BCA signal serves as a subject, it becomes easy to separate a BCA signal, and a BCA detection pulse with a high precision can be outputted. Therefore, the high data reader of the decode capacity of BCA data can be offered.
[0018] A means to count the pulse width of the playback pulse in a detection pulse generating means is common in the CLV (Constant Linear Velocity) control means which measures the pulse width of a playback pulse and controls the rotational speed of an optical disk. Then, it is possible to realize the function of a detection pulse generating means by this CLV control means, a circuit scale is made small, it is compact, and is low cost and the high data reader of the ability to regenerate of BCA data can be offered.
[0019]
[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is explained based on a drawing. Drawing 1 is the block diagram of one example of the optical disk regenerative apparatus 70 equipped with the function as a data reader of this invention. Based on the optical head (optical pickup) 78 which forms an optical spot in DVD79 which is an optical disk, and generates an analog signal from the reflected light, the error signal generating circuits 75 which generate focusing and a tracking error signal with the signal from the optical head 78, and these error signals, it has tracking and the servo mechanism 76 which carries out a focusing servo for the optical head 78.
[0020] On the other hand, in the optical disk regenerative apparatus (it sets henceforth and is an optical disk unit) 70 of this example, the analog signal 2 which reproduced the pit of DVD79 by the optical pickup 78 is inputted into RF binary-ized means 3. RF binary-ized means 3 is a means to change an analog signal 2 into binary [digital], measures the pulse width of the digital pulse (playback pulse) 4 of the output made binary, and has the function which carries out digital control of the slice level so that this value may turn into a desired value. In the case of DVD, it is the modulation technique which NRZI record is carried out, and the appearance probability of "1" and "0" in the playback pulse 4 averages a modulation technique called 8/16 modulation, and becomes by a unit of 50%. Therefore, RF binary-ized means measures time amount width of face of "1" of the playback pulse 4 of an output, and "0", and it controls slice level so that the rate becomes 50%.
[0021] And the playback pulse 4 digitized by making it such is supplied to the signal regeneration means

71, and decodes the data recorded on the optical disk 79 by the pit. On the other hand, when reading BCA explained based on drawing 15 , BCA data are also read besides the data recorded by the pit. Then, the pulse width of the regenerative signal 4 which is the output of RF binary-ized means 3 is counted with the detection pulse generating means 50, and the signal of pulse width which separates from 8/16 modulation of a pit is caught, and he outputs as a BCA detection pulse 8, and is trying to decode with the BCA recovery decode means 9 in the optical disk unit 70 of this example.

[0022] The BCA recovery decode means 9 generates the data 10 of BCA from the detection pulse 8, and outputs them to a terminal 11. The BCA recovery decode means 9 can carry out recovery decode in software with the microcomputer carried in the optical disk unit 70, and can realize the function that hardware is also equivalent.

[0023] The circuit diagram of one example of RF binary-ized means 3 is shown in drawing 2 . It is the example which realized RF binary-ized means 3 by the analog circuit, and the analog signal 2 inputted from the terminal 1 is inputted into + input terminal of a comparator 15 through the high-pass filter of the time constant decided by the capacitor 12 and resistance 13. Since one end of resistance 13 is connected to the bias voltage Vr of 14, the signal 26 with which bias of the + input terminal was carried out to the electrical potential difference Vr is inputted. On the other hand, the electrical potential difference 16 of slice level is connected to - input terminal of a comparator 15. The output 17 of a comparator 15 is outputted from a terminal 19 as a digital pulse 4 through an inverter 18.

[0024] Slice level 16 is set up so that the high level and low of pulse width of a comparator 15 may become equal. [of an output 17] For this reason, a slice level component is generated for the pulse which digitized through two inverters 61 through a low pass filter 62, it is amplified with amplifier 63, and it is considering as the slice electrical potential difference (slice level) 16.

[0025] On the other hand, drawing 3 is the example which constituted RF binary-ized means 3 from a digital circuit. A slice level component is generated by the Up/Down counter 20. The clock generated by PLL is inputted from a terminal 22 from the system clock 21 made from crystal etc., or the signal made binary, then this Up/Down counter 20 operates from it. When the digital pulse 17 after binary-izing is "H", the appearance rate of "H" of the digital pulse 17 and "L" can be measured by counting down at the time of count-up and "L." When there are many appearance rates of "L", Up/Down counter 20 output value turns into a value by the side of minus, the slice level 16 which is the output of D/A converter 25 also falls, and as a result, the digital pulse 17 is controlled so that the time amount width of face by the side of "L" becomes short. On the contrary, when there are many appearance rates of "H", the output value of the Up/Down counter 20 turns into a value by the side of plus, the slice level 16 which is the output of D/A converter 25 also goes up, and as a result, the digital pulse 17 is controlled so that the time amount width of face by the side of "H" becomes short. Thus, the appearance probability of "L" of the digital pulse 7 and "H" serves as a control loop which becomes **** 50% by controlling slice level 16.

[0026] Furthermore, irrespective of the output value of the Up/Down counter 20, RF binary-ized means 3 of this example is equipped with the slice level generation circuit 23 which can fix slice level 16, chooses the output of the Up/Down counter 20, and the output of the slice level generation circuit 23 with the selection means 24, and can supply it now to D/A converter 25.

[0027] The signal wave form of each part of RF binary-ized means 3 is shown in drawing 4 . Slice level 16 becomes the location where the appearance probability of "L" of the digital pulse 7 and "H" becomes **** 50% in the part which is reproducing the pit to the analog signal 26 by which bias was carried out to the electrical potential difference Vr inputted into + input terminal of the comparator 15 of RF binary-ized means 3. On the other hand, since the long pulse of "L" appears in the stripe field in which the BCA signal appeared, slice level 16 falls by work of the Up/Down counter 20. And if it becomes the field which has a pit after that, slice level 16 will go up and will become the location where the appearance probability of "L" of the digital pulse 7 and "H" becomes **** 50%.

[0028] If slice level 16 is changed when a BCA signal appears, separation with a BCA signal and a RF signal may become difficult. The possibility is high especially when BCA with long pulse width continues. Therefore, when reproducing a BCA field, it is desirable to choose the fixed value set as the

slice level generation circuit 23 with the selection means 24. As shown in the wave of drawing 4 , since slice level just detects the stripe part of BCA, its margin is large from the bottom of a stripe part to the peak level in a pit playback part. In order to confirm CLV control and to control the rotational speed of an optical disk in this to mention later, it is desirable to output the digital pulse 4 in a pit part. Therefore, it turns out that near the condition of having controlled slice level 16 is good. For this reason, even if it fixes slice level 16 to the bias level Vr in the analog-spectrum form 26 by which bias was carried out with bias voltage Vr14, it is possible to acquire the playback pulse 4.

[0029] On the other hand, playback in the pit part on which the data of the usual DVD are recorded is performed, the slice level generation circuit 23 is made to memorize the output value of the Up/Down counter 20 in the condition of carrying out slice level control, this value is chosen as playback of a BCA field with the selection means 24, and there is also the approach of using it as fixed slice level in it. According to this approach, the playback pulse 4 which also included the BCA signal with the slice level 16 near the center of the amplitude of the optimal analog signal 26 for binary-izing of a RF signal is generable. Therefore, separation with a RF signal and a BCA signal becomes easy by a RF signal's not riding on a BCA signal and counting pulse width with the detection pulse generating means 50.

[0030] The block diagram has shown the circuit of the detection pulse generating means 50 to drawing 5 . Moreover, the signal wave form of each part is shown in drawing 6 . From a terminal 31, the system clock 32 generated with the crystal oscillator etc. or the clock obtained from PLL of a reversion system is inputted. From a terminal 27, the playback pulse 4 which carried out the party rate of the RF regenerative signal is inputted. Falling of a pulse and the edge of a standup are detected in the edge detector 28, and the edge detecting signal 29 is outputted. And the die length of "H" of the playback pulse 4 and the period of "L" is counted with a clock 32 with the data length detection counter 33.

[0031] The longest pattern is 14T (T is 1 data bit period) of a sink pattern in 8/16 modulation adopted with DVD. Therefore, the pulse by the RF signal and the pulse by the BCA signal are separable by identifying the pattern beyond 14T. 1 data-bit periods T are T= 1 / value which becomes 26.16MHz in 1X playback. If the frequency of a clock 32 is set to 33.8688MHz, the die length of 14T will become a part for about 18 clocks at the time of 1X playback. Supposing it follows, for example, reproduces a BCA field by 1/2X, if allowances are seen from 36 which is the counted value of 14T, for example, it is set as 64 times, separation with the pattern of the 8/16 longest modulation of 14T and a BCA signal can be performed. What is necessary is just to enable modification of this value from the exterior. The wave of drawing 6 is an example at the time of setting a upper limit as 64 times. The edge signal 29 occurs with the edge of the playback pulse 4, and counted value is reset by 0 and counted up. While a count reset pulse will be generated and counted value will be reset by zero since it exceeded 64 times of a upper limit if counted value amounts to 63, a detecting signal 51 is outputted outside. Further, counted value went by the example of this drawing to 63, and is counted to the value [carry out / once again / count reset] 13, in it. A detecting signal 51 is continuously outputted until the following edge signal comes, and pulse width adjustment is not carried out.

[0032] If data are reproduced in a BCA field, in the stripe part of BCA, the long pulse of "H" will appear to the digital pulse 4. Although counted value surpasses a upper limit and a detecting signal 51 is outputted, the detecting signal 51 to which pulse width is not adjusted is also possible for recovery decode of BCA.

[0033] Furthermore, the detection pulse generating means 50 of this example shown in drawing 5 is giving the function performed by disregarding the polarity side of the pulse generated when the polar judgment circuit 39 is formed and it passes through a mirror field to the counter 33 for data length detection. This function is prepared in order to operate the rough servo of CLV also in seeking originally. By passage of a mirror field, a pulse occurs in a specific polarity apart from the playback pulse of a DVD data pit during seeking. Since the difference with the die length of 14 T pulses which are the longest patterns of 8/16 modulation, and the pulse by the mirror is large when a seeking rate is slow, the pulse by the mirror is removable by preparing an upper limit in counted value. When a seeking rate becomes quick, a difference with the die length of 14 T pulses which are the longest patterns, and the pulse by the mirror becomes small, and it becomes impossible however, to remove the pulse by the

mirror only by preparing an upper limit in counted value. However, since the polarity was decided, the pulse by the mirror should just be made not to perform count actuation for detection of pattern length about the polar pulse of the side there.

[0034] The pulse polarity distinction circuit 39 distinguishes the polarity of the digital pulse 4, is an enable signal 40 and performs enabling control of the count of the counter 33 for data length detection. In this example, the pulse according [the polarity of the digital pulse 4] to a mirror occurs in the "L" side. Therefore, a count is enabled only at the time of the pulse of "H", and it controls not to count at the time of the pulse of "L."

[0035] The measurement wave of the signal when using this function and reproducing a BCA field is shown in drawing 7 . It turns out that the long pulse of "H" of the digital pulse 4 which is the pulse width of the stripe of BCA in the case of reproducing a BCA field resembles the long pulse of "L" by the mirror. Although the detection pulse 8 (here, they are a detecting signal 51 and equivalence) is generated by the long pulse of "H" of the playback pulse 4 of drawing 7 , since a counter does not operate by the polar distinction circuit, as a result, it turns out by the long pulse of "L" by passage of a mirror field that the detection pulse 8 is not generated. Therefore, if this invention is used, when reproducing a BCA field, also with the condition of OFF of a truck servo, it is stabilized and playback of BCA data can be performed.

[0036] On the other hand, an optical spot can be formed in a mirror field, if the property of the servo mechanism 76 of an optical disk unit 70 is changed and the truck servo of the optical head 78 is made into reversed polarity. Since the pit is not formed in the mirror field, the pit component which leaks to the whole signal becomes small, and the BCA signal in the analog level by the stripe (bar code) which recorded BCA is emphasized. That is, since it is nonreflective when passing the stripe of BCA although analog signal level mainly shows the maximal value by the total reflection by mirror level except the stripe of BCA if truck-on is carried out at reversed polarity, analog signal level shows the minimal value. Therefore, the existence of a signal becomes clear and decreases error detection. For this reason, the detection precision of a BCA detection pulse can be improved.

[0037] Furthermore, in the detection pulse generating means 50 of this example, it has the counter 52 for pulse duration adjustment which outputs the BCA detection pulse 8 of predetermined pulse width based on the BCA detecting signal 51 outputted with the counter 33 for data length detection. Therefore, the pulse width supplied to the recovery decode means 9 from the detection pulse generating means 50 of this example becomes fixed, and it becomes easy to recognize the detection pulse 8 in the recovery decode means 9. For example, when the long pulse duration for recognizing a BCA signal with the counter for data length detection is taken, and spacing of a BCA signal is short, there is sometimes only pulse width whose BCA detecting signal 51 is 1 clock extent. Therefore, if the high-speed clock signal is used, the consecutive recovery decode means 9 cannot detect a BCA detecting signal. Moreover, if pulse width is not fixed, one pulse may be recognized as two or more pulses. Although it is necessary to give an edge detection function to CPU which constitutes the recovery decode means 9 in order to prevent such incorrect detection, this will narrow the selection range of CPU and the degree of freedom of a design is checked.

[0038] On the other hand, if the BCA detection pulse of fixed pulse width is outputted with the detection pulse generating means 50, such a problem can be solved and the error detection by the leakage in recognition and a decode mistake can be prevented. Moreover, in the counter 52 for pulse duration adjustment, while keeping step with the pulse width of suitable die length according to a format of BCA and outputting the BCA detection pulse 8 (while asserting), the mask of the BCA detecting signal 51 outputted from the counter 33 for data length detection is carried out. The effect of the defect on the optical disk which appears to the timing according to a BCA format by this, for example, a black spot etc., can be removed.

[0039] The processing in the detection pulse generating means 50 is explained referring to drawing 8 and drawing 9 . The polarity of the signal described so far of the binary-ized data 4 treated here is the reverse sense, "H" in the binary-ized data 4 is a mirror field side, and "L" is on the BCA detection side. This is decided by the signal-processing process which will be followed by the time it obtains the

binary-ized data 4, and differs by whether the inverter [in / drawing 2] 18 enters. However, since these polarities are known things in an equipment design, they can operate the polar judgment circuit 39 according to it.
[0040] Moreover, the clock obtained from PLL is used for the detection pulse generating means 50 taken up here. Since one clock is equivalent to 1 T parts of playback data, the clock obtained from PLL can separate BCA by seeing allowances from 14T of the longest pattern, for example, detecting the pattern beyond 20T.
[0041] First, if the binary-ized data 4 are changed from a low to a high level at time of day t1, the edge detecting signal 29 will be outputted from the edge detector 28. Since it is judged in the polar judgment circuit 39 at this time that a BCA signal differs from a polarity, an enable signal 40 is set to a low. Therefore, a count is not started in the counter 33 for data length detection.
[0042] If the binary-ized data 4 are changed from a high level to a low, the edge detecting signal 29 will be outputted to time of day t2, and an enable signal 40 will be outputted to it as a result of a polar judgment. Therefore, the counter 33 for data length detection starts a count from the timing of the following clock which is falling of the edge detecting signal 29. In addition, in this example, as mentioned above, the pattern beyond 20T is detected as BCA.
[0043] If the count result of the counter 33 for data length detection is set to 19 at time of day t3, since it will be recognized that it is not a RF signal, the BCA detecting signal 51 is outputted. Thereby, the counter 52 for pulse duration adjustment starts a count from the next time of day t4, and the BCA detection pulse 8 is outputted to coincidence. Since the counter 52 for pulse duration adjustment has already begun actuation, it may be held, even if the counter 33 for data detection is reset like the example of drawing 6 in time of day t4, or as shown in this Fig. Since the binary-ized data 4 are set to a high level, the BCA detecting signal 51 is reset with the following clock, but since the counter 52 for pulse duration adjustment is formed, the BCA detection pulse 8 of the predetermined pulse width PW1 (this Fig. 8) is outputted to time of day t5. For this reason, it is as having mentioned above that the recognition in the consecutive recovery decoder circuit 9 became easy.
[0044] On the other hand, the case where the polar judgment circuit 39 is not formed is shown in drawing 9 . When there is no polar judgment circuit 39, also in the timing to which the binary-ized data 4 were changed from the low to a high level in time of day t6, the counter 33 for data length detection starts a count. And since the condition continues long enough, the counter 33 for data length detection counts up, and the BCA detecting signal 51 is outputted to time of day t7. Consequently, the BCA detection pulse 8 is outputted from the time of day t8 which is the following timing.
[0045] The BCA detection pulse 8 of time of day t8 is a signal when crossing a mirror field, and is not a signal by BCA. Therefore, in a recovery decode means 9 by which this was received, it is necessary to carry out the error correction of this signal. Thus, it is possible by forming the polar judgment circuit 39 to prevent that the BCA detection pulse 8 is outputted accidentally.
[0046] signs that, as for drawing 10 , the pulse width of the BCA detecting signal 51 is changed according to the condition of the binary-ized data 4 -- on the other hand, signs that the BCA detection pulse 8 with fixed pulse width is outputted in the detection pulse generating means 50 of this example are shown. Since the relation between the binary-ized data 4, the counter 33 for data detection, the BCA detecting signal 51, the counter 52 for pulse duration adjustment, and the BCA detection pulse 8 is as having explained by making it the above, detailed explanation is omitted. If spacing of the signal by the mirror field and the signal by BCA is short as shown in this Fig., the pulse width of the BCA detecting signal 51 will become narrow rapidly. However, since the counter 52 for pulse duration adjustment is formed, from the detection pulse generating means 50 of this example, the BCA detection pulse 8 with fixed pulse width can be supplied. For this reason, it is as having mentioned above that decode becomes easy in the recovery decode means 9.
[0047] The case where the noise by defect like the black pit BT is in the binary-ized data 4 at drawing 11 is shown. Since the relation between the binary-ized data 4, the counter 33 for data detection, the BCA detecting signal 51, the counter 52 for pulse duration adjustment, and the BCA detection pulse 8 is as having explained by making it the above, detailed explanation is omitted. If Noise BT is in the time

amount included in the pulse width PW1 at the binary-ized data 4 after the counter 33 for data detection counts up and the BCA detection pulse 8 is outputted, the pulse output of the BCA detecting signal 51 asserted by it will not be disregarded and carried out. Therefore, the counter 52 for pulse adjustment is not influenced at all, but passes along it till then, and continues count-up. That is, outputting the pulse which started again as for the trigger by the noise BT which exists within the limits of the pulse width PW1 of the BCA detection pulse 8 is suppressed. Thus, by choosing the pulse width PW1 of the pulse 8 for BCA detection as the suitable value according to a BCA format, the mask of the BCA detecting signal 51 by the noise which rode on the binary-ized data 4 to the timing which cannot exist if it is original can be carried out, and it can prevent the effect attaining to the BCA detection pulse 8.
[0048] Thus, the detection pulse generating means 50 of this example can output the BCA detection pulse 8 with little incorrect detection. For this reason, the load of a recovery decode means can be reduced and the high optical disk unit 70 of the decode capacity of BCA data can be offered at high speed.
[0049] The example of the optical disk unit 70 which both [control means / 5 / drawing 12 / CLV] used the function as a detection pulse generating means 50 mentioned above is shown. The CLV control means 5 outputs a control signal to the motor control means 6 so that pulse width may be measured and the rotational frequency of a disk may become a default in response to the digital pulse 4, and it performs CLV control so that the rotational speed of a spindle motor 7 may be kept constant. Moreover, by 8/16 usual modulation technique, when the time amount width of face of the digital pulse 4 inputted is beyond a predetermined value that is, when the pulse which is the die length not appearing is detected by the CLV control means 5, in it, it has the function to generate the detection pulse 8. While reproducing the RF signal which is data of the usual DVD, this detection pulse is used for decision of what it was under seeking, the truck was crossed and is passed through the mirror field, and the overrun prevention which it is usually used as a detecting signal of a defect at the time of playback, and the control signal of a spindle motor 7 is held, or is PLL of a focus, the servo system of a truck, or a data reversion system. Therefore, since the stripe part into which BCA data were cut will serve as the same signal as a defect if this detection function is used as it is at the time of BCA playback, the detection pulse 8 is acquired in the stripe section.
[0050] The circuit block diagram of one example of the CLV control means 5 is shown in drawing 13 . From a terminal 31, the clock 32 generated with the crystal oscillator etc. is inputted. From a terminal 27, the playback pulse 4 which is a digital pulse which carried out the party rate of the RF regenerative signal is inputted. Falling of a pulse and the edge of a standup are detected in the edge detector 28, and the edge detecting signal 29 is outputted. Control of CLV has the rough servo mode which measures the pattern length of the digital pulse 4, and the fine servo mode which measures the sink frame length which exists in the playback pulse 4. Here, it explains in detail about the rough servo mode related to this invention. In rough servo mode, the pattern of 14T which are the longest pattern in the digital pulse 4 modulated 8/16 using the clock 32 is detected. Therefore, the same function as the counter 33 for data length detection explained previously is required, and it is incorporated. A counter 33 counts the die length of "H" of the digital pulse 4, and the period of "L" with a clock 32. The longest pattern detection period counter 30 is a counter which counts counting the count to which the edge came and being set to 512. The longest pattern count circuit 25 performs the comparison with the counted value which 14T ideal merit deserves in the largest value in the pulse of 512 counts of a count set up by the longest pattern detection period counter 30. If a 33.8688MHz clock is used, the die length of 14T will become a part for about 18 clocks at the time of 1X playback. The size or the same comparison result for multiple times (for example, eight batches) is memorized by the continuation detector 36, and when it is the size with the all same 8 times, or the result of being the same, the output-control circuit 37 outputs the signal which accelerates / slows down a spindle motor from a terminal 38.
[0051] Drawing 14 removes the polar distinction circuit 39 from the CLV control means 5 shown in drawing 13 . Therefore, although the counter 33 for data length detection operates by the specific polar pulse apart from the playback pulse of the DVD data pit generated by passage of a mirror field, it originates in it and the BCA detection pulse 8 may be outputted, in many cases, an error correction can

be carried out with the decode recovery means 9.
[0052] In addition, in each above-mentioned example, although the case where a system clock 32 is used, and the case where the clock of a PLL system is used have been shown, if a PLL system clock is used, BCA detection will be attained by the same circuitry ** [according to / reproduction speed]. On the other hand, if a system clock is adopted, since a BCA signal is detectable with the clock of constant frequency, there is the description that it is stabilized and BCA data can be decoded.
[0053]
[Effect of the Invention] He performs binary-ization of an analog regenerative signal using RF binary-ized means of the method which controls slice level, and is trying to identify a RF signal and a BCA signal by counting the pulse width of the playback pulse which is the digital output according to the data reader of this invention, as stated above. Therefore, it is possible to prevent a leakage lump of a RF signal, and BCA data can be reproduced with a sufficient precision.
[0054] Furthermore, when counting the pulse width of a BCA signal, about the pulse by the side of the polarity of the pulse generated when it passes through a mirror field, the function in which the die length is not detected can be added by performing a polar judgment. Therefore, by using for playback in a BCA field, when reproducing a BCA field, also with the condition of OFF of a truck servo, it is stabilized and playback of BCA can be performed.
[0055] Furthermore, it is possible by turning on a truck in reversed polarity to acquire a BCA signal in a mirror field, and since signal level is emphasized, detection precision improves further. And by arranging the pulse width of the BCA detection pulse outputted when a BCA signal is detected to compensate for a BCA format, the incorrect recognition in a recovery decode means is prevented, and a data reader with still higher decode capacity can be offered.
[0056] Such a BCA detection pulse can be outputted using the function to generate a detection pulse when more than the die length predetermined in the digital pulse width in the CLV control means which controls the engine speed of a disk is detected, and even when the disk engine speed has shifted from the specified speed, it can reproduce BCA data correctly. Therefore, since the function for there being also no need of preparing a low pass filter complicated as an additional circuit in addition to a CLV control means, and reproducing the data of DVD can be used as it is, a circuit can be simplified and data readers, such as an optical disk regenerative apparatus, can be realized at low cost.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The block diagram showing the outline configuration of the data reader (optical disk regenerative apparatus) concerning the gestalt of operation of this invention.
[Drawing 2] It is drawing showing an example of RF binary-ized circuit shown in drawing 1 .
[Drawing 3] It is drawing showing the example from which RF binary-ized circuit shown in drawing 1 differs.
[Drawing 4] It is the signal waveform diagram of each part of drawing 3 .
[Drawing 5] It is the block diagram showing the configuration of the detection pulse generating means shown in drawing 1 .
[Drawing 6] It is the signal waveform diagram of each part of drawing 5 .
[Drawing 7] It is a signal waveform diagram to show the effectiveness of this invention.
[Drawing 8] It is the timing chart which shows the processing in a detection pulse generating means.
[Drawing 9] It is the timing chart which shows the processing in the detection pulse generating means when not performing polar distinction.
[Drawing 10] It is the timing chart which shows the effectiveness of the pulse duration adjustment device of a detection pulse generating means.
[Drawing 11] It is a timing chart when the noise of a defect is on binary-ized data.
[Drawing 12] It is the block diagram showing the example of the optical disk regenerative apparatus which made the detection pulse generating means serve a double purpose by the CLV control means.
[Drawing 13] It is the circuit block diagram of one example of the CLV control means in the optical disk regenerative apparatus shown in drawing 12 .
[Drawing 14] It is the circuit block diagram showing other examples of a CLV control means.
[Drawing 15] It is drawing of the DVD disk with which BCA was recorded.
[Drawing 16] It is the wave form chart showing the concept of a playback wave of BCA.
[Drawing 17] It is the block diagram of the conventional optical disk regenerative apparatus.
[Drawing 18] It is the signal waveform diagram of each part of drawing 17 .
[Description of Notations]
2 RF Regenerative Signal
3 RF Binary-ized Means
4 Digital Pulse
5 CLV Control Means
8 Detection Pulse
9 BCA Decode Tone Decode Means
15 Comparator
16 Slice Level
20 Up/Down Counter
23 Slice Level Generation Circuit
24 Selection Means

25 D/A Converter
28 Edge Detector
33 Data Length Detection Counter
39 Polar Distinction Circuit
50 Detection Pulse Generating Means
52 Counter for Pulse Duration Adjustment
70 Optical Disk Regenerative Apparatus (Data Reader)
75 Error Signal Generation Circuit
76 Servo Mechanism
78 Optical Head
79 DVD

[Translation done.]

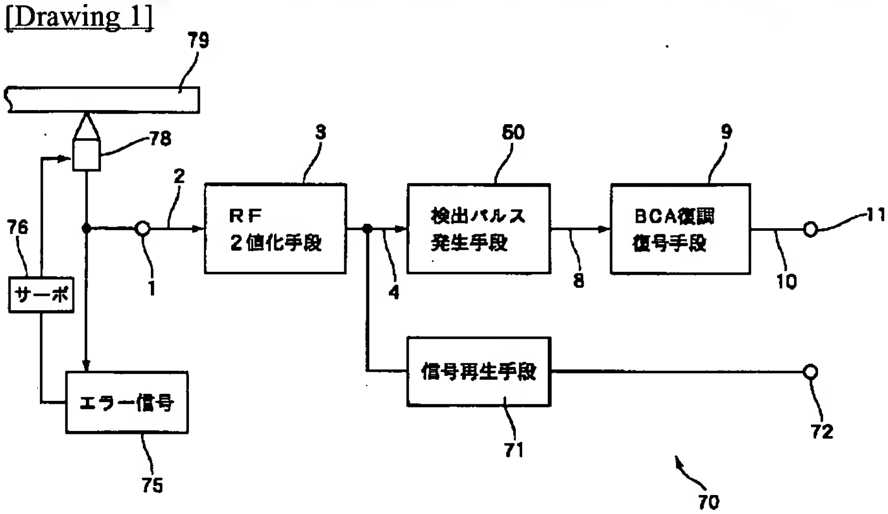
* NOTICES *

JPO and INPIT are not responsible for any damages caused by the use of this translation.

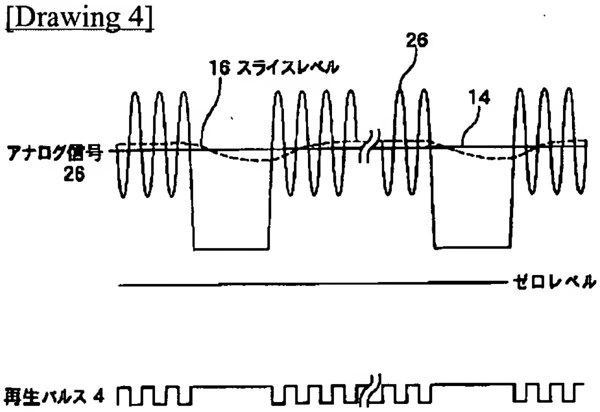
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

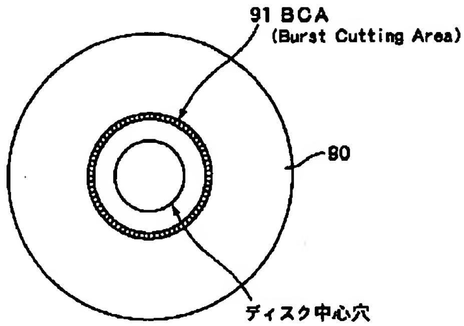
[Drawing 1]



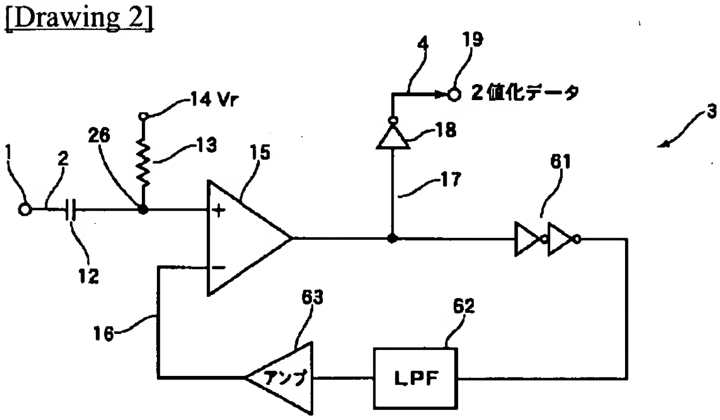
[Drawing 4]



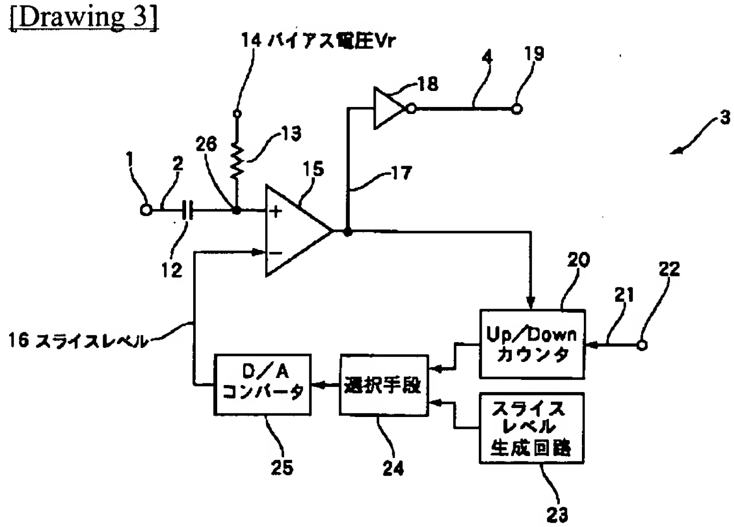
[Drawing 15]



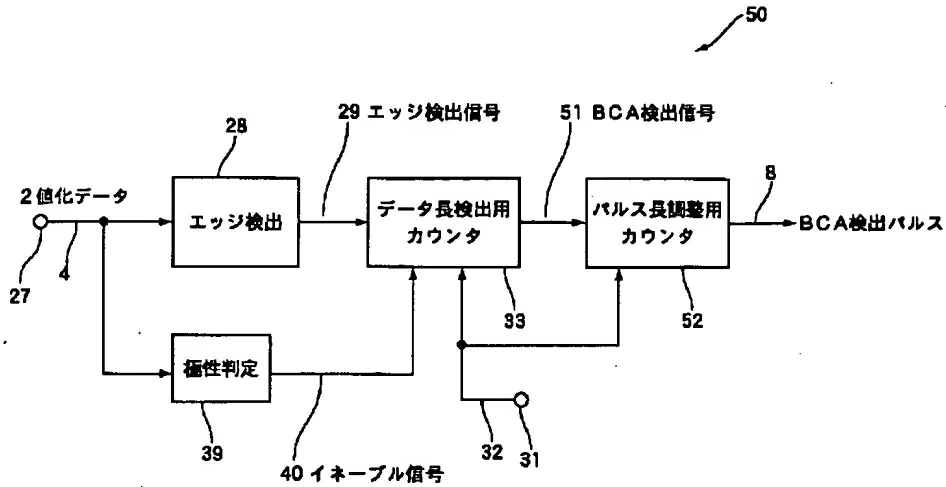
[Drawing 2]



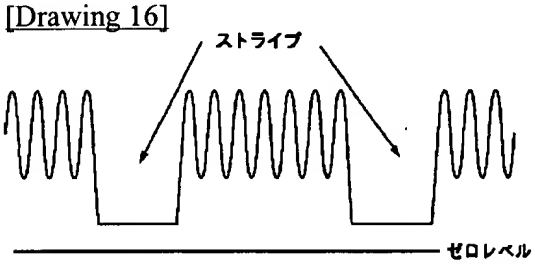
[Drawing 3]



[Drawing 5]



[Drawing 16]



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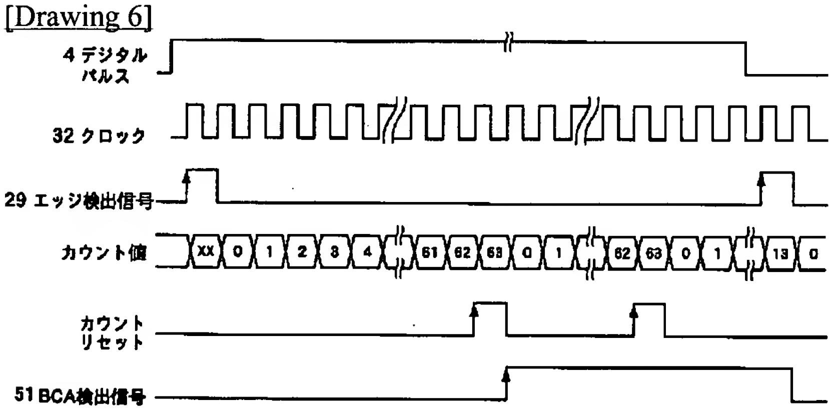
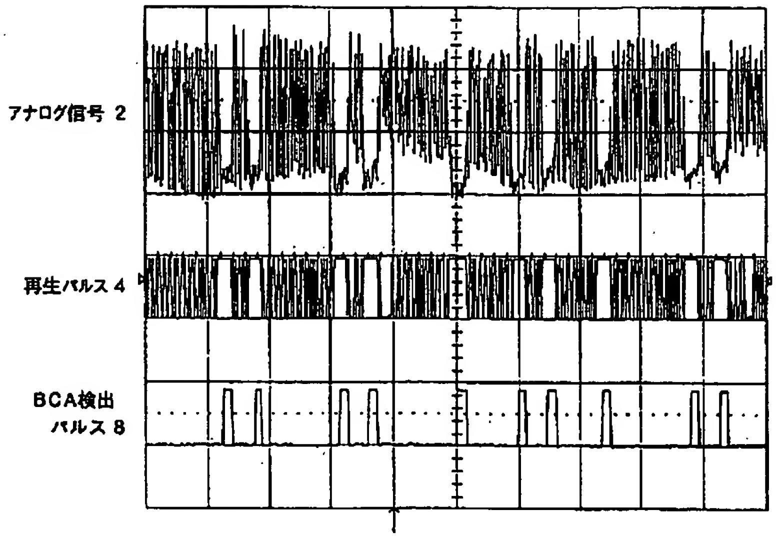
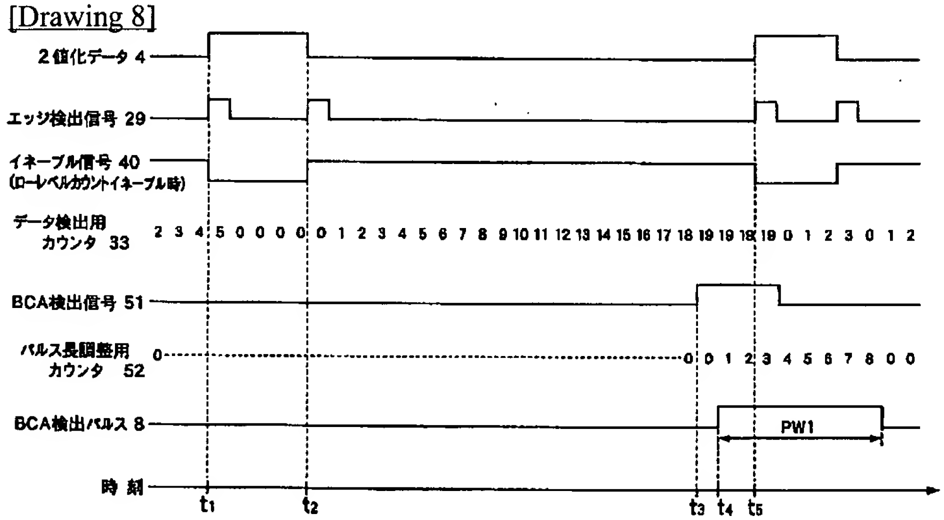


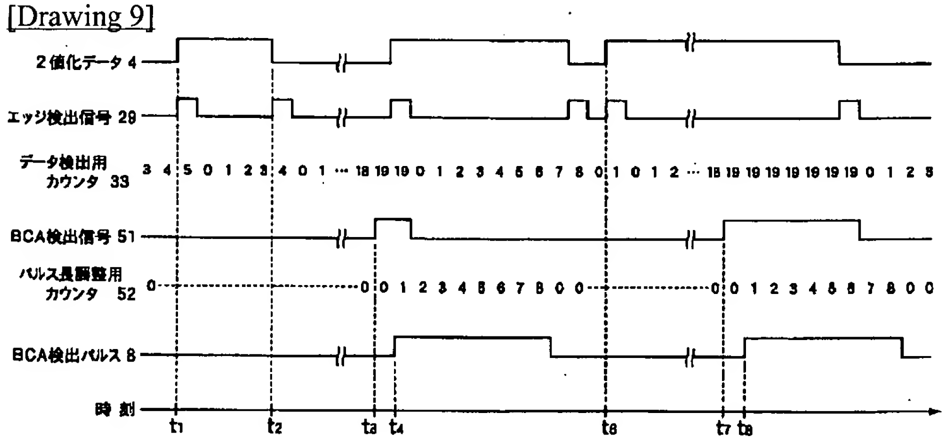
[Drawing 7]



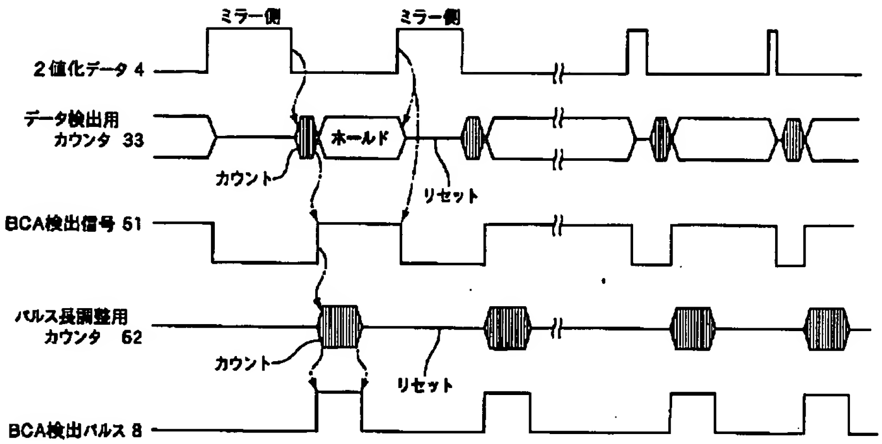
[Drawing 8]



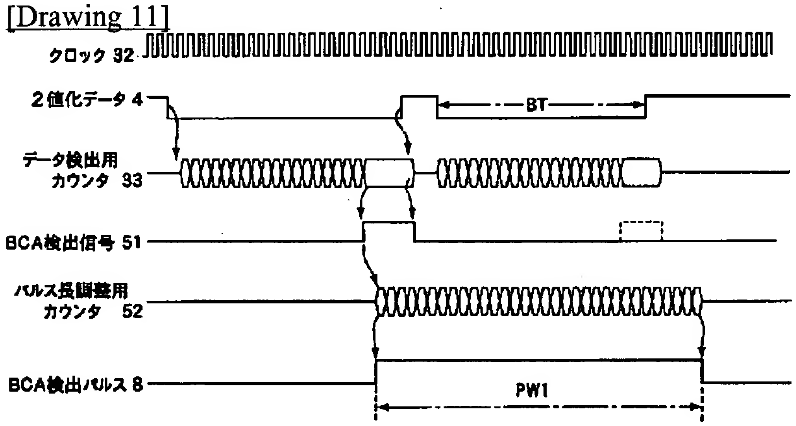
[Drawing 9]



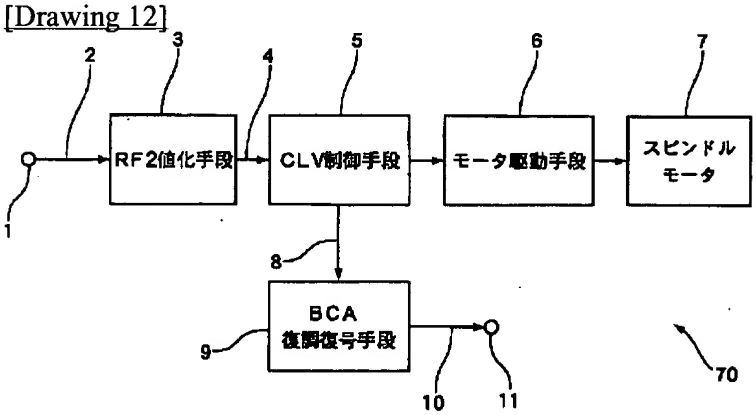
[Drawing 10]



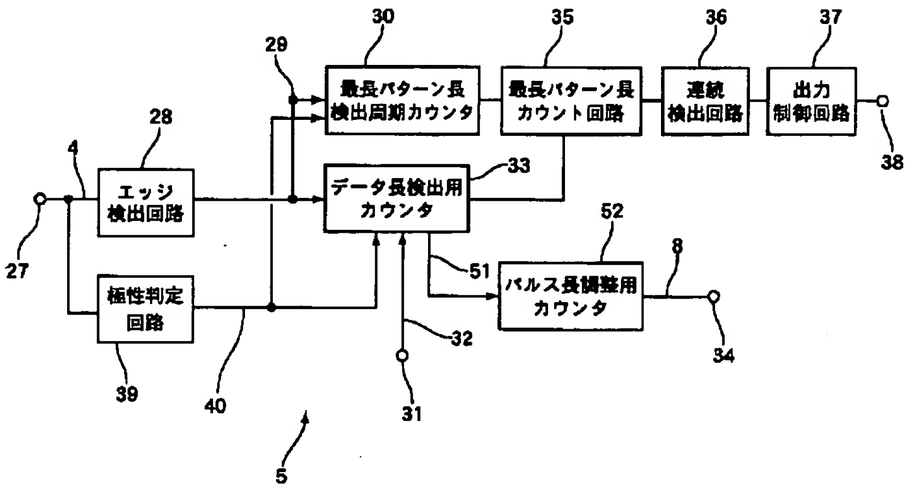
[Drawing 11]



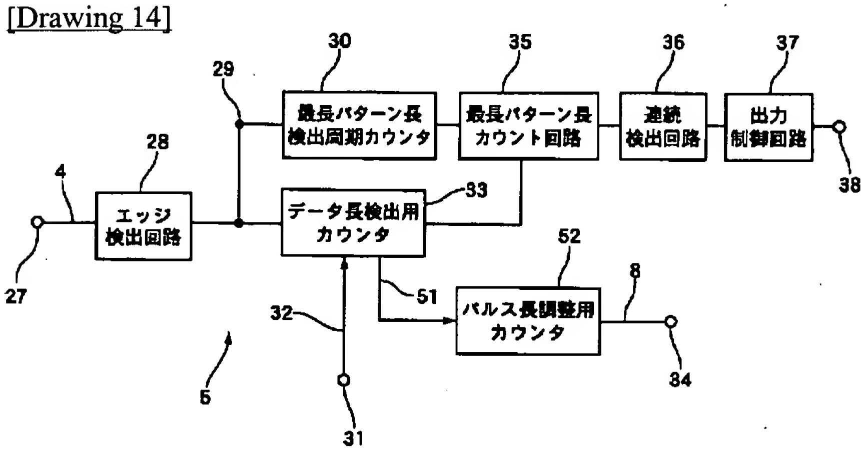
[Drawing 12]



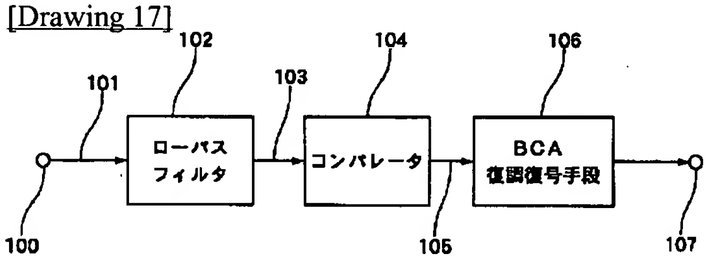
[Drawing 13]



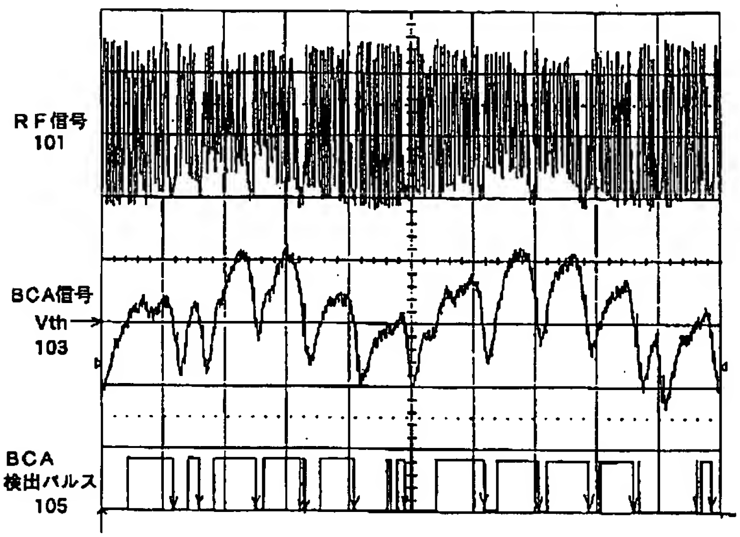
[Drawing 14]



[Drawing 17]



[Drawing 18]



[Translation done.]